DECLARATION

We,

Norbert Weghaus, Irlerhof 3c, D-51399 Burscheid, Germany,
Otto Pfitzer, Becherstraße 80, D-42719 Solingen, Germany,
Andreas Berktold, Sternstraße 63, D-41460 Neuss, Germany,

declare the following:

1. We are the inventors of an invention which has been filed with the U.S. Patent and Trademark Office as patent application serial no. 10/725,410 on December 3, 2003, claiming the priority of European application serial no. 02 027 028.6 of December 3, 2002.

2. We are fully experienced in the design and manufacturing of internal broaches for internally broaching profiles in workpieces. Furthermore we are familiar with the prior art cited by the USPTO in connection with our aforesaid invention, in particular with US 2,683,919 of Psenka. Further, we have studied the office actions of January 31, 2005, November 3, 2005, March 20, 2006 and September 18, 2006. Further, we are aware of the replies to these office actions.

3. Known internal broaches have a shank, a toothed section and a tail end. The shank is held by a broaching machine puller, which pulls the broach through a workpiece held in the broaching machine, broaching the profiles in doing so. The toothed section comprises a great number of rows of broach cutting teeth. These cutting teeth are disposed successively in line to the broaching direction and are progressively stepped in depth, so that all the broach cutting teeth that serve for machining a profile into the workpiece cut a chip for producing the bottom of the profile.

   Some of the known internal broaches have broach cutting teeth having blades for cutting the bottom of the profile and also blades for cutting the flanks of the profile. During the broaching operation of such known internal broaches, displacement of the axis of the broach may occur so that each of the successively engaging teeth has a varying center position relative to the workpiece that is to be machined. Also, a torsional deviation may be caused by rotatory forces during broaching. Often, profile accuracy and flank surface quality are not sufficient using such known internal broaches.

4. Psenka (US 2,683,919) teaches an internal broach dealing with the problem to establish an accurate helical guiding action using a broach relying on teeth having a guiding flank which does not cut. Psenka teaches a broaching teeth sequence for machining a specific profile in a workpiece having a first group of teeth being designed to cut a tooth space substantially narrower than the final desired profile space in the workpiece. Material removed by this first group of teeth in the se-

quence is shown as cuts A, B, C and D in figure 4. The teeth of this first group cut over their whole profile, i.e. over their whole flanks and over their whole bottom. After this first group of teeth, a second group of teeth follows and enlarges the initial slot to full width and to the same depth as the slot cut by the first group of teeth. Material removed by this second group of teeth in the sequence is shown as cuts E, F and G in figure 4. An example for one of the teeth, F, of this second group is depicted in figure 5 of Psenka '919 as tooth 70. The teeth of the second group have a guiding flank (compare 52 in figure 5). In addition, the teeth of the second group have a cutting part 76. This cutting part 76 has a cutting flank opposing the guiding flank 72 and a cutting bottom. Neither the cutting flank nor the cutting bottom of the cutting part 76 extend over the full flank height or bottom width of an individual tooth, i.e. tooth 70 in figure 5 of this second group. Instead, the tooth flank opposing the guiding flank 72 is stepped and comprises the cutting flank of the cutting part 76 on the one hand and a flank part 74 being distant from the workpiece, i.e. being no cutting flank. As well, the bottom of the individual tooth 70 of the second group of teeth is stepped into a cutting bottom part of the cutting part 76 and into a guiding bottom part between the flank part 74 and the guiding flank 72.

Psenka's tooth sequence is truly sophisticated and costly to manufacture. Further, broaching a given profile depth requires a lot of subsequent teeth. In addition, the broaching force interacting between one tooth of Psenka's tooth sequence and the workpiece as a rule varies within this sequence leading to a broaching action with torsional forces which are difficult to control and which should affect the surface quality and the precision of the desired profile form negatively.

5. In order to overcome the above mentioned limitations, we found to our surprise that it is possible to design an internal broach having multiple rows of multiple successive teeth, wherein each of the teeth has a guiding flank being designed as a single curved plane, a cutting bottom cutting over the full width of the desired profile in the workpiece and, opposing the guiding flank, a second flank being designed as a non-cutting relieved edge which only at the point where this relieved edge passes into the cutting bottom, i.e. at the corner of the tooth being formed between the bottom and the relieved flank, forms the desired profile flank of the workpiece. During operation, each cutting tooth cuts over the full width of its bottom, while guiding action nearly exclusively takes place at the guiding flank. Not only the guiding flank is designed as a single curved plane but also the bottom and the second, relieved flank. Therefore, the teeth are, in particular compared to Psenka, easy to manufacture. To our own surprise, any deviation of a central longitudinal axis of the broach from its original and thus nominal position during operation is hampered or at least largely prevented by the guiding flanks which upon any such deviation or motion are pressed against the corresponding flanks of the workpiece approximately along half the circumference of the broach. In studying this

surprising effect we found that with our design no chip removal takes place on the guide edges of the guiding flanks. Therefore, a lateral motion or deviation of the broach does not take place with our design.

6. Psenka gives no hint as to such a cutting process and to its advantages. Further, cutting teeth having in combination a guiding flank on the one hand and having single curved flanks and bottoms on the other are not taught by Psenka '919. Therefore, neither the design of Psenka nor the disclosure of the other cited prior art was of help for us to make the invention.

7. Enclosed we present pictures of a workpiece broached with an internal broach according to our invention. It clearly can be seen that the broached profile flanks are smooth and have no staggered surface. Quality measurements of such workpieces have proved to meet even the highest standards.

8. We declare further that our statements made herein of our own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application of any patent issued thereon.

Solingen, December 21., 2006

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